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SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/183,800	01/21/94	YAMAZAKI	S 0756958

EXAMINER	
SAADAT, M	

B5M1/0305

SIXBEY, FRIEDMAN, LEEDOM & FERGUSON
2010 CORPORATE RIDGE
SUITE 600
MCLEAN, VA 22102

ART UNIT	PAPER NUMBER
2508	28

DATE MAILED: 03/05/96

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined. ☒ Responsive to communication filed on 11/15/95 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire THREE (3) month(s), 0 days from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☒ Notice of References Cited by Examiner, PTO-892.
2. ☐ Notice re Patent Drawing, PTO-948.
3. ☐ Notice of Art Cited by Applicant, PTO-1449.
4. ☐ Notice of informal Patent Application, Form PTO-152.
5. ☐ Information on How to Effect Drawing Changes, PTO-1474.
6. ☐ _____

Part II SUMMARY OF ACTION

1. ☒ Claim(s) 23-35 are pending in the application.
   Of the above, claim(s) _____ withdrawn from consideration.
2. ☐ Claim(s) _____ have been canceled.
3. ☐ Claim(s) _____ allowed.
4. ☒ Claim(s) 23-35 are rejected.
5. ☐ Claim(s) _____ objected to.
6. ☐ Claim(s) _____ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawing(s) under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawing(s) are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable. ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction(s), filed on _____, has been ☐ approved. ☐ disapproved (see explanation).
12. ☒ Acknowledgment is made of the claim for priority under 35 USC 119. The certified copy has ☐ been received ☐ not been received ☒ been filed in parent application, serial no. 07/852,517 ; filed on 03/17/92 .
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

Serial Number: 08/183,800

Art Unit: 2508

Part III DETAILED ACTION

After Final Amendment under rule 129

1. Amendment filed November 15, 1995 under 37 C.F.R. 1.129 has been entered as paper No. 25 and been considered as to the merits.

Claim Rejections - 35 USC § 112

2. Rejection of claim 32 under 35 U.S.C. § 112, second paragraph, as set forth in the previous office action, has been overcome by November 15, 1995 amendment.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

4. Claims 23-32 are rejected under 35 U.S.C. § 103 as obvious over Nakagawa et al (U.S. Patent No. 4,766,477) in view of Wilson et al (U.S. Patent No. 4,755,865). The Nakagawa et al reference discloses a thin film transistor with a polycrystalline silicon channel layer 101 formed over an insulating surface of the substrate 100 where a gate electrode 110 via a gate insulating layer 105 contacts the channel layer. The channel layer is a polycrystalline material having oxygen, nitrogen, or carbon concentration at 0.01-5 atomic % levels and average crystal grain size of 200 Å or more. See Nakagawa et al at column 3, lines 16-52 and at column 4, lines 17-44. Nakagawa et al reference discloses the claimed invention except for the intrinsic channel layer. Wilson et al reference teaches that it is known to form thin film transistors (TFT) with an undoped polysilicon channel layer and prevent the diffusion of dopant from source/drain region into the intrinsic channel as set forth at column 3, lines 33+. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the TFT of Nakagawa with an intrinsic channel layer, as taught by Wilson et al in order to maintain the dopants in source/drain regions without diffusion into the channel regions and prevent the oxide degradation. Further, the instant specification provides an example of the claimed invention as example 2 in page 18 with a channel layer that has phosphorus at a concentration of $3x10^{17}$

atoms/cm. Such concentration remains in the layer even after crystallization and the resultant layer is not intrinsic. The disclosure is an admitted example by Applicants that the claimed invention works equally well with a doped or an intrinsic channel layer.

5. With regard to the claim limitations of Raman shift measurements in claims 23-35 no direct reference in the specification can be found to indicate a relation to the claimed structure other than a post construction activity for measurement of the grain size as an indication of the crystallinity. The Raman shift numbers are all obtained by changing the amount of oxygen, nitrogen, or carbon which as commonly known in the art result in change of the crystallization of the amorphous silicon and formation of larger grain sizes. The specification refers to similar properties in the paragraph linking pages 8 and 9 by stating that electron mobility is higher for films containing less amorphous components which is a known and inherent property of the recrystallized silicon. Therefore, the prior art structure also meets the Raman shift measurement limitations in claim 23, the ratio of a FWHM in claim 25, and the peak intensity ratio Ia/Ic in claim 27 since all the structural limitations and properties related to and resulting in such measurements are anticipated by the cited reference and indicating the grain size measurements of the prior art device is equivalent to the Raman

shift numbers, ratio of a FWHM and peak intensity ratio Ia/Ic for the specified grain size and impurity concentrations. It is known in the art that the shift to 522 cm-1 for a single crystal silicon indicates the degree of crystallinity. The grain size is also measured by the half width which is 50 to 500 Å for such impurity levels.

6. Note that the claims 29-32 are product by process claims and the final structure of the claimed invention do not distinguish over the cited reference. The polycrystal silicon layer may be recrystallized by any method such as laser anneal or simply by any other method of heat treatment. A "product by process" claim is directed to the product per se, no matter how actually made, In re Herein, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessman, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marosi et al, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that

applicant has the burden of proof in such cases, as the above caselaw makes clear.

Double Patenting

7. Claims 23-35 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 5,313,076. Although the conflicting claims are not identical, they are not patentably distinct from each other because the final product in '076 patent is substantially similar to the claimed invention, specifically in regard to the transistor structure and the oxygen concentration in the polysilicon layer.

8. The obviousness-type double patenting rejection is a judicially established doctrine based upon public policy and is primarily intended to prevent prolongation of the patent term by prohibiting claims in a second patent not patentably distinct from claims in a first patent. *In re Vogel*, 164 USPQ 619 (CCPA 1970). A timely filed terminal disclaimer in compliance with 37 C.F.R. § 1.321(b) would overcome an actual or provisional rejection on this ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 C.F.R. § 1.78(d).

Allowable Subject Matter

9. Claims 33-35 are allowable over the prior art of record.

10. The following is an Examiner's statement of reasons for the indication of allowable subject matter: The prior art does not show the oxygen concentration at levels bellow the claimed

concentration of $1x10^{19}$ atoms/cm^3 and limits the concentration to levels above 0.03 atomic % which is about $1.5x10^{19}$ atoms/cm^3. Such low oxygen concentration is essential for improved carrier mobility.

Response to Arguments

11. Applicant's arguments with respect to claims 23-35 filed November 15, 1995 have been fully considered but they are not deemed to be persuasive.

a. In response to Applicant's argument that Nakagawa reference does not include certain features of Applicant's invention, the limitations on which the Applicant relies (i.e., the semiconductor layer later being recrystallized) are not stated in the claims as structural limitations. The recrystallization of the sputtered semiconductor layer and the CVD deposition of a polycrystal semiconductor layer both result in the same final structure. Therefore, it is irrelevant whether the reference includes "the step of recrsytallization" or not. limitations should not be read into a claim. E.g., In re Prater, 415 F.2d 1393, 1404-5, 162 USPQ 541, 550-51 (CCPA 1969). Accord In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) ("pending claims must be interpreted as broadly as their terms reasonably allow"). The fact that structural limitations not present in claim are also not in the cited prior

art references is irrelevant. Prater, 415 F.2d at 1404-5, 162 USPQ at 550-51.

b. Once a prima facie case of obviousness is established by Examiner, the burden shifts to applicants to rebut it with objective evidence of non-obviousness. E.g., In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). In the present case, the structural limitations of the claimed invention are met by the combination of the cited prior art where the limitation of measuring the structural features such as the Raman shift appears to be redundant.

c. With regard to the obviousness-type double patenting rejection, the limitation of the melting of the semiconductor film is a process step done before the final structure is formed. The step of recrystallization of the semiconductor layer may be significant in a process claim where it becomes of no consequence in a device claim. Therefore, the final structure of the claimed invention contains polysilicon layer similar to that of the '76 patent. Although the Raman shift numbers may cover different ranges, as long as there is some overlap both inventions cover identical areas in spite of the small size of the common area.

Conclusion

12. The allowable subject matter has been identified with regard to claims 33-35. The allowable claims are further rejected under

the judicially created doctrine of obviousness-type double patenting. A proper and timely filed terminal disclaimer in compliance with 37 C.F.R. § 1.321(b) would overcome a provisional rejection on this ground.

13. Papers related to this application may be submitted to Art Unit 2508 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). Any informal/courtesy copies or papers should be clearly labeled as such at the top of the front page to expedite the dispersement of the submitted FAX papers.

The Art Unit 2508 **Fax telephone number is (703)308-7723** which is to be used only for faxing papers related to Group 2500 applications.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahshid Saadat whose telephone number is (703) 308-4915.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956.

Mahshid Saadat

MAHSHID SAADAT
PRIMARY EXAMINER
GROUP 2500

mds
March 1, 1996